The First International Conference on Energy and AI

icaai 2020 | Program

January 9-12, 2020

Tianjin, China

energy-ai.org

Foreword

Dear Friends and Colleagues,

Welcome to the First International Conference on Energy and AI (ICEAI, 2020), to be held in Tianjin on January 9-12, 2020.

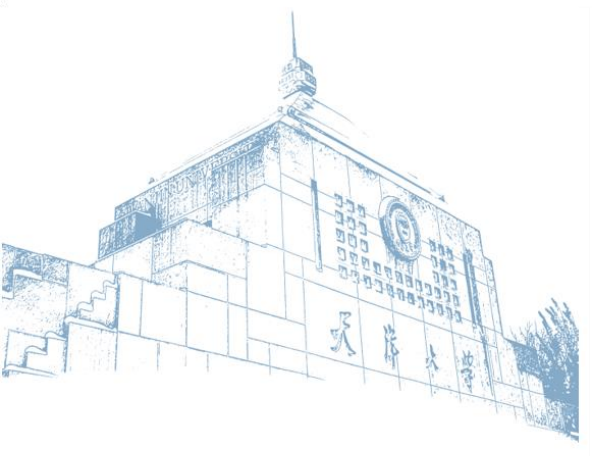
The First International Conference on Energy and AI (ICEAI 2020) is hosted by Tianjin University. It aims to provide an authoritative platform for leading scientists and researchers to exchange and share the latest research progress in the cross-disciplinary area of energy and AI, focusing on the innovative applications of AI to address the critical challenges in energy systems, energy materials, energy chemistry, energy utilization & conversion, energy & society, as well as other important pressing issues. The conference also aims to promote the development of AI technologies for advancing the energy, decarbonization and sustainable development, such as data-driven approaches, optimization algorithms and AI ethics. There will also be a focus on building up links for future collaborations.

We also invite you to explore Tianjin, Tianjin is one of the four municipalities directly under the central government of China, with the highest density and higher education in China, and to experience the development of Chinese traditional culture.

Conference Co-chairs:

Raffaella Ocone Kui Jiao Jin Xuan

January 1, 2020



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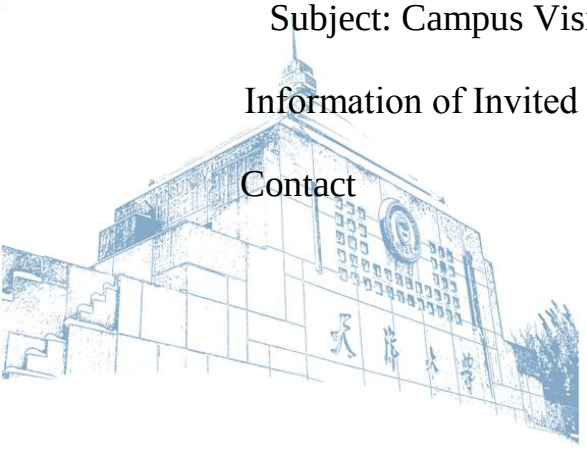
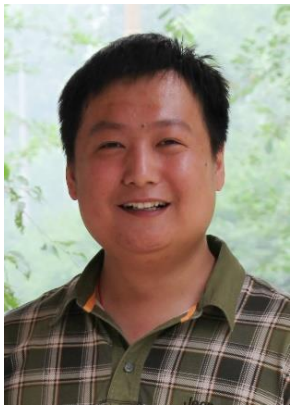


Conference Co-chairs

Prof. Raffaella Ocone

Heriot-Watt University, UK

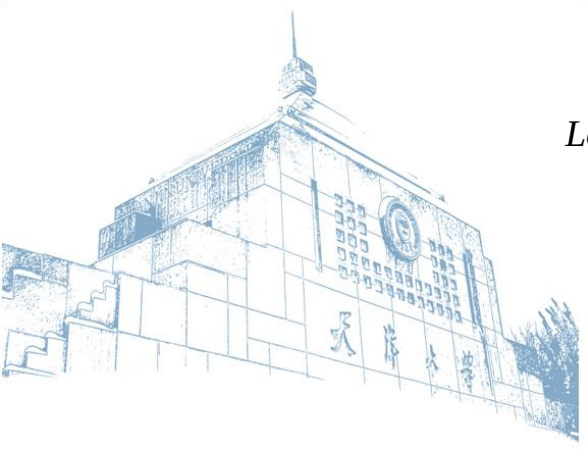


Prof. Kui Jiao

Tianjin University, China

Prof. Jin Xuan

Loughborough University, UK



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Mingfa Yao (*China*)

Nada Zamel (*Germany*)

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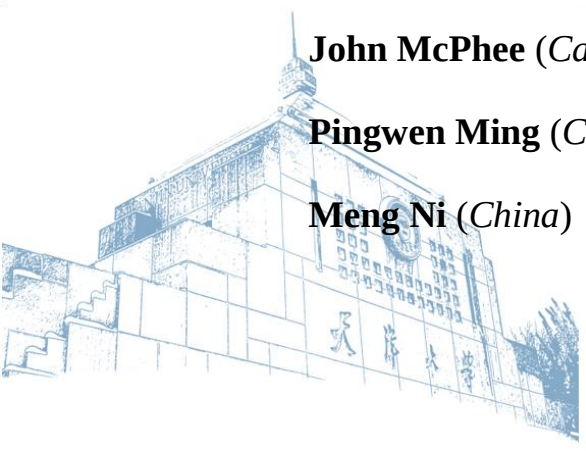
Bingfeng Zu (*China*)



Local Organizing Committee

Fuqiang Bai, *Tianjin Internal Combustion Engine Research Institute*

Shuai Deng, *Tianjin University*

Cheng Fan, Shenzhen University

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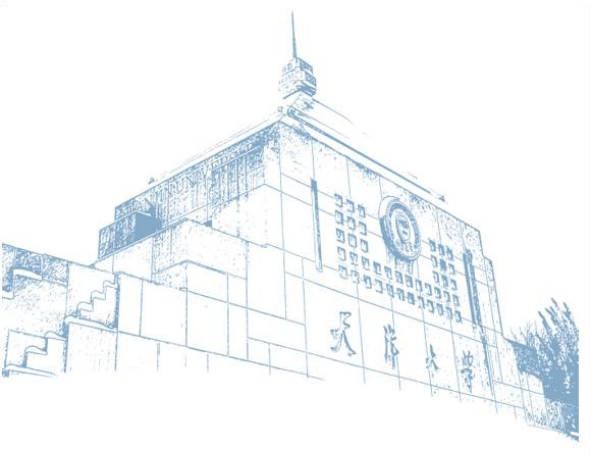
Yan Yin, *Tianjin University*

Fan Zhang, *Tianjin University*

Junfeng Zhang, *Tianjin University*



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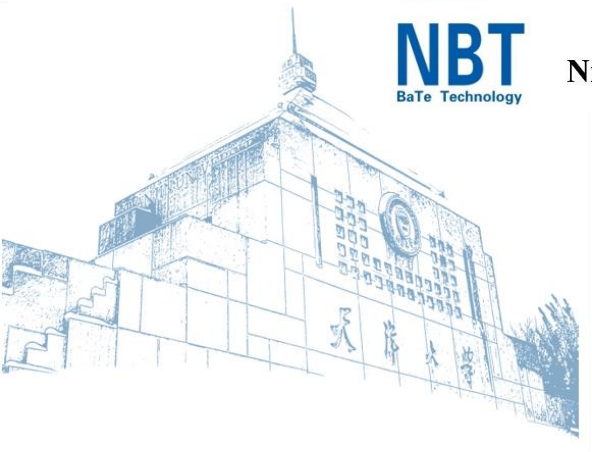


Conference Venue

Society Hill International Conference Center Hotel（社会山国际会议中心酒店）

Room A: The No.1 Banquet Hall, 1st Floor.

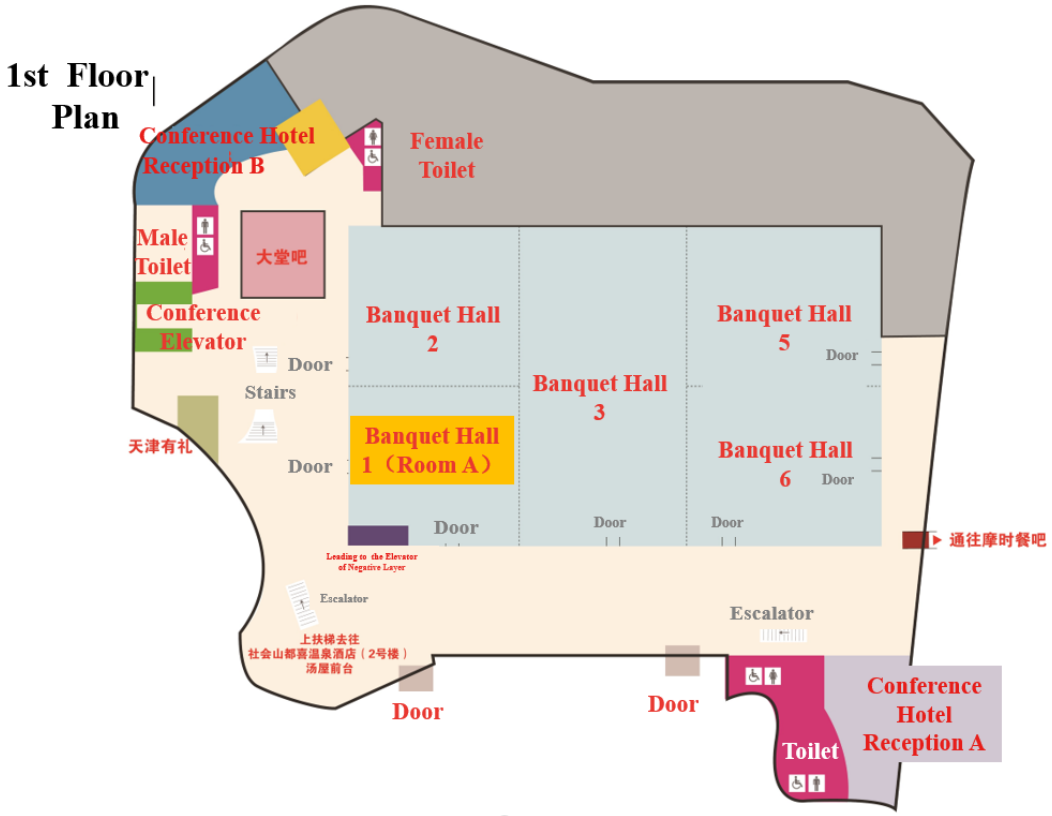
Room B: The No.3 Function Room, 4th Floor.

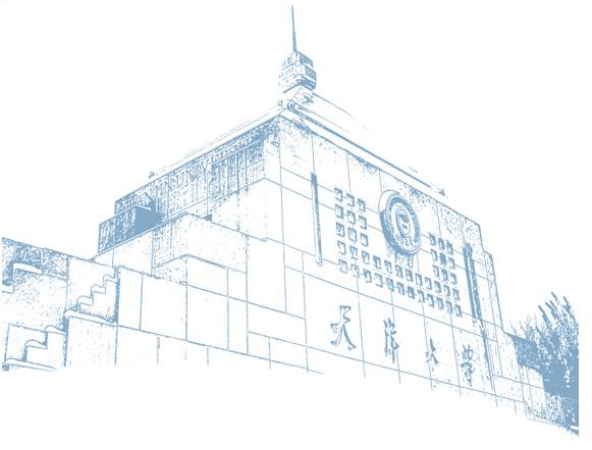
Room C: The No.5 Function Room, 4th Floor.

Buffet Restaurant: Romano Buffet Restaurant, 2nd Floor

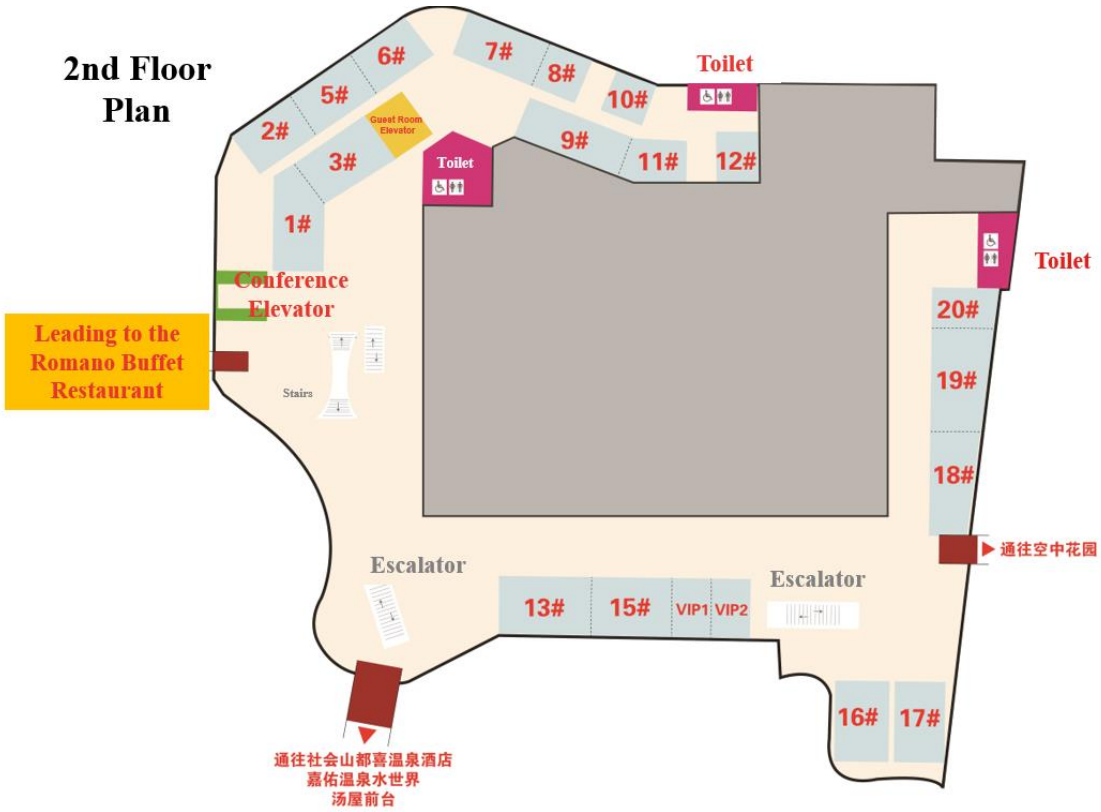
Address: 198 Zhijing Road, Xiqing District, Tianjin

（天津市西青区知景道 198 号）

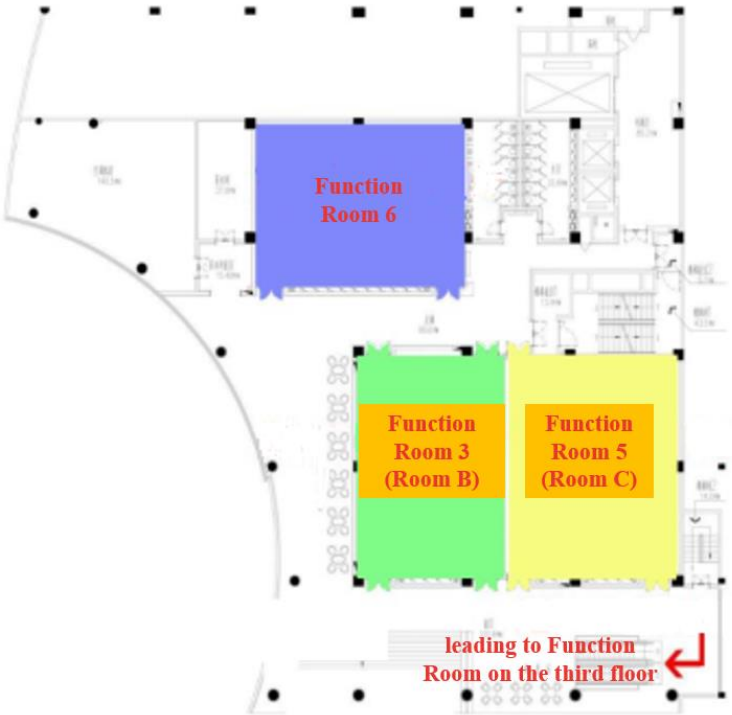


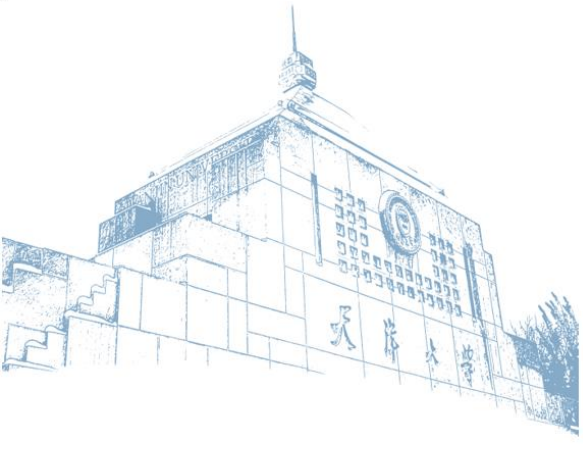


2nd Floor Plan



4th Floor Plan

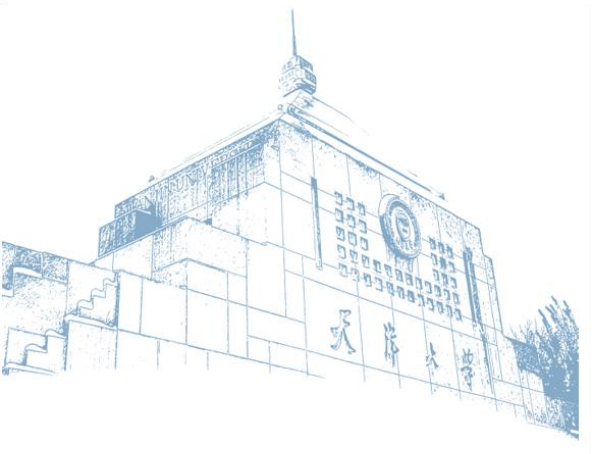




Agenda Overview

9th-12th January, Tianjin, China

Date	Time	Activities	Location
9th January, 2020	10:00-21:00	Conference Registration	Society Hill International Conference Center Hotel
10th January, 2020	8:20-8:40	Opening Ceremony	Room A
	8:40-11:50	Plenary Lecture	
	13:30-18:10	Oral Presentation	Room A & B & C
11th January, 2020	8:20-12:00	Plenary Lecture	Room A
	13:30-16:10	Oral Presentation	Room B & C
	13:30-16:15		Room A
	16:25-17:35	Plenary Lecture	Room A
		Closing Ceremony	
12th January, 2020	9:00-11:00	Campus Visit	Tianjin University



Program

9th January, 2020, Thursday, 10:00-21:00
Society Hill International Conference Center Hotel
Subject: Registration

Time	Program
10:00-21:00	Conference Registration
18:30-20:30	Buffet Dinner

10th January, 2020, Friday, 8:20-11:50 Room A
Subject: Opening Ceremony & Plenary Lectures

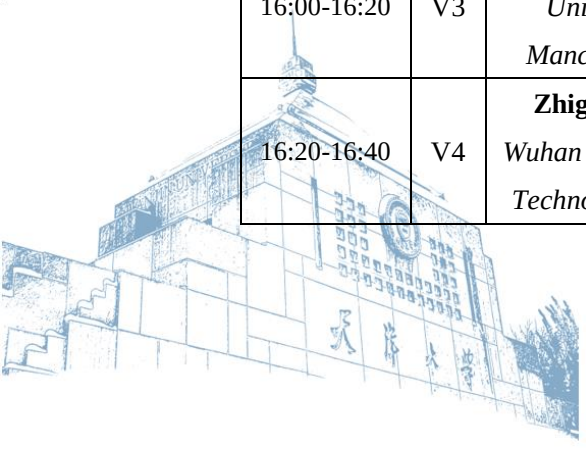
Time	Program	Chair
8:20-8:40	**Opening Ceremony**	**Prof. Kui Jiao**
8:40-9:20	**Plenary – 1:** Energy 4.0: Evolution and Revolution of Energy Systems **Speaker :** Prof. Xianguo Li, University Of Waterloo	
9:20-9:50	**Group Photo & Coffee Break**	
9:50-10:30	**Plenary – 2:** Accelerating the Green Transition Using AI and Energy Systems Integration **Speaker :** Prof. Henrik Madsen, Technical University of Denmark	**Prof. Jin Xuan**
10:30-11:10	**Plenary –3:** Publishing in Energy & AI: Trends and Perspectives **Speaker** : Ms. Debora Logan, Elsevier	
11:10-11:50	**Plenary – 4:** Electrochemical Batteries and Lithium Batteries for New Energy Electric Vehicles: Status, Challenges, Perspectives **Speaker :** Prof. Jiujun Zhang, Shanghai University	
11:50-13:20	**Buffet Lunch and Rest**	

10th January, 2020, Friday, 13:30-18:10 Room A

Subject-1: AI for Electrochemical Energy-1

Co-Chairs: Jae Wan Park & Zhengkai Tu & Dongda Zhang & Zhigang Zhan

Time	ID	Author	Title
13:30-13:50	V1	**Jae Wan Park** *University of California, Davis, USA*	**Invited:** Development and demonstration of microgrid system utilizing second-life electric vehicle batteries
13:50-14:10	V2	**Zhengkai Tu** *Huazhong University of Science and Technology, China*	**Invited:** Lifespan prediction of a FC vehicle based on data analysis
14:10-14:25	R1	Yupeng Wang	Application of digital technology in the development of fuel cell system
14:25-14:40	R2	Yanzhou Qin, Guokun Liu, Yifan Yin	Control strategy of fuel cell electric vehicle
14:40-14:55	R3	Qiang Li, Anyu Bai, Sun Hong	Preparation of sulfur and nitrogen co-doped reduced graphene oxide modified graphite felt electrode and its electrocatalytic activity towards VO^{2+}/VO^{2+} reaction
14:55-15:10	R4	Xianda Sun, Yinshi Li, Mingsheng Hao, Yuxuan Lou, Lu Li	Direct ethanol fuel cell with the carbon-decorated anode and ordered cathode
15:10-15:25	R5	Yuhui Ma	Floating parallel high-gain converter with switched capacitor for fuel cell application
15:25-15:40	R6	Xuan Zhao, Hong Sun	Effect of cathode humidification degree on PEMFC under preloading force
15:40-16:00	**Coffee Break**		
16:00-16:20	V3	**Dongda Zhang** *University of Manchester, UK*	**Invited:** Machine learning techniques for chemical and biochemical process digitalisation
16:20-16:40	V4	**Zhigang Zhan** *Wuhan University of Technology, China*	**Invited:** PEM fuel cell modeling and engineering application



16:40-16:55	R7	Haoran Xu, Jingbo Ma, Meng Ni	Combined multi-physics simulation and artificial neural network model for fast and accurate online optimization in SOFC operation
16:55-17:10	R8	Xing Xiang, Lei Chen	Performance analysis on vashishta force field for thermal properties prediction of silica aerogel
17:10-17:25	R9	Ying Liu, Hong Sun, Tianyu Zhang, Qiang Li, Song Li	The influence of wave channel flow field plate on the performance of HT-PEMFC
17:25-17:40	R10	Chengyuan Gong, Jun Shen, Yi Yu, Kaiqiang Wang, Zhengkai Tu, Siew Hwa Chan	A novel radiator structure for enhanced heat transfer used in PEM fuel cell automobile
17:40-17:55	R11	Guobin Zhang, Kui Jiao	Flow field optimization in proton exchange membrane fuel cell utilizing machine learning
17:55-18:10	R12	Yuesong Wang, Hong Sun, Song Li, Qiang Li	Research on optimization design and application of flow field plate structure for VRFB
18:30-20:00	**Buffet Dinner**		

10th January, 2020, Friday, 13:30-18:10 Room B

Subject-2: AI for Power Machinery-1

Co-Chairs: Daniele Marchisio & Hongtao Xu & Jiao Yu & Hong Sun

Time	ID	Author	Title
13:30-13:50	V5	**Daniele Marchisio** *Politecnico di Torino, Italy*	**Invited:** Application of multiscale modelling and deep learning tools for the simulation of multiphase polydisperse flows
13:50-14:10	V6	**Hongtao Xu** *University of Shanghai for Science and Technology, China*	**Invited:** The 3D information-integrated system development for industrial and utility boilers based on the VR technology
14:10-14:25	R13	Gao Yan	Modeling and dynamic simulation of a hybrid electric vehicle coupled with waste heat recovery system

14:25-14:40	R14	Tao Chen, Hui Xie, Shengwen Tong, Hao Zhang, Bencong Yang	Establishment and application of intelligent twin model of hybrid power system
14:40-14:55	R15	Xueqing Fu, Jianjun Yang, Shuangxi Liu, Haiyang Gao, Baosen Wang, Yongfei Ma, Xianfeng Zhang	A rule-based real-time energy management strategy for P2 hybrid electric vehicle optimized by dynamic programming
14:55-15:10	R16	Kun Fu, Haiyang Lin,Mengna Mao, Haotian Wu, Qie Sun, Ronald Wennersten	Multi-agent based analysis about vehicle-to-grid capacity and output
15:10-15:25	R17	Xun Liu, Zuguo Shen, Yadong Deng, Chuqi Su, Yiping Wang	Study on an integrated system with automotive thermoelectric generator and localized thermoelectric cooling air conditioner based on a commercial vehicle
15:25-15:40	R18	Yang Zheng, Hong Sun	Effect of graphene doped multi-walled carbon nanotubes cathode materials on discharge capacity of lithium air battery
15:40-16:00	**Coffee Break**		
16:00-16:20	V7	**Jiao Yu** *Shanghai Palcan New Energy, Co., Ltd, China*	**Invited:** Reformed methanol fuel cell technology and its application in intelligent energy
16:20-16:40	V8	**Hong Sun** *Shenyang Jianzhu University, China*	**Invited:** Mass transfer and structure design of Li-air battery
16:40-16:55	R19	Yanxiang Yang, Yuanqing Zhang, Changwen Liu, Fuqiang Bai, Lian Xie, Hongtao Zhang	Smart control of exhaust after-treatment system development for a ship engine to get better fuel economy and emission

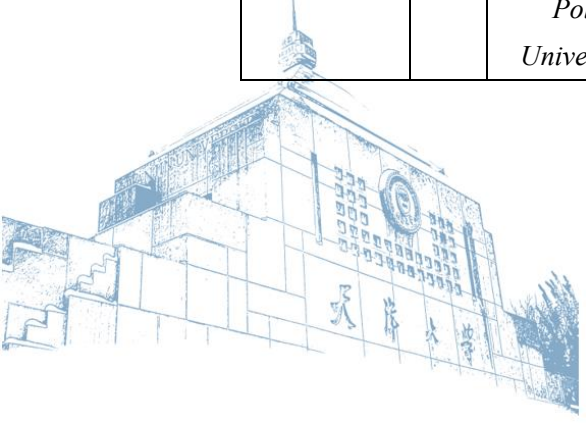
16:55-17:10	R20	Tao Lai, Jianfei Zhang, Zhiguo Qu	GPU accelerated numerical simulation of the effective thermal conductivity for 3D fibrous materials using Lattice Boltzmann method
17:10-17:25	R21	Jinpeng Wang, Jie Li, Sidan Liu, Hong Sun	First-principles study of catalytic oxygen reduction reaction on Si doped MoS_2 monolayer
17:25-17:40	R22	Qianlong Wang, Zhen Li, Haifeng Liu, Mingfa Yao, Tao Ren	A novel machine learning approach to recover complete flame temperature field in soot radiation-based thermometry
17:40-17:55	R23	Zhezhe Han, Md. Moinul Hossain, Yuwei Wang, Chuanlong Xu	Burner condition monitoring of 300MW coal-fired boiler through flame imaging and deep neural network
17:55-18:10	R24	Yanqing Cui, Zunqing Zheng, Mingsheng Wen, Qinglong Tang, Chao Geng, Qianlong Wang, Haifeng Liu, Mingfa Yao	Optical diagnostics on the effects of reactivity stratification on flame development in dual-fuel combustion
18:30-20:00	**Buffet Dinner**		

10th January, 2020, Friday, 13:30-18:10 Room C

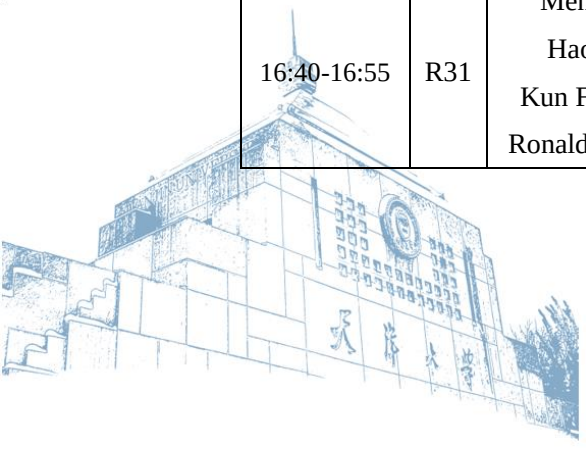
Subject-3: AI for Energy Systems-1

Co-Chairs: Fu Xiao & Jun Cai & Yinshi Li & Akeel Shah

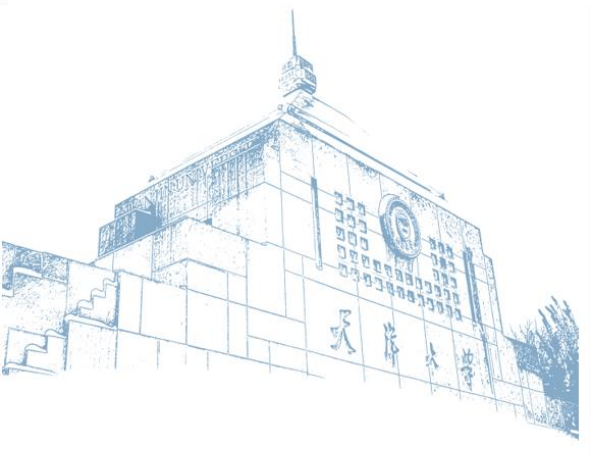
Time	ID	Author	Title
13:30-13:50	V9	**Fu Xiao** *The Hong Kong Polytechnic University, China*	**Invited:** Big data and AI for smart energy efficient buildings



13:50-14:10	V10	**Jun Cai** *Shanghai Hydrogen Propulsion Technology, China*	**Invited:** The ABC's application in fuel cell system development–AI, big data and cloud
14:10-14:25	R25	Qiong Wang, Huizhi Wang	Understanding of the inhomogeneous compressed electrode in flow battery
14:25-14:40	R26	Xuewei Shi, Chao Tan, Feng Dong	Identification of gas-oil-water three phase flow pattern with ultrasonic doppler and conductance sensor
14:40-14:55	R27	Xuelong Zhou, Xiangyang Zhang, Yunhui Lv, Qixing Wu	Towards AI-assisted electrode design for high-power all vanadium flow batteries
14:55-15:10	R28	Kangcheng Wu, Bingfeng Zu, Jin Xuan, Kui Jiao	Application of neural networks in proton exchange membrane fuel cell: Predicting electrochemical active surface area and water content curves
15:10-15:25	R29	Yan Yin, Shiyu Wu, Suhui Ma, Yuwen Liu, Qiaoyu Guo, Junfeng Zhang, Yanzhou Qin	Effect of trapezoidal baffle block tilted angles on quantitative reactant gas flux and performance of PEM fuel cell
15:25-15:40	R30	Hong Sun, Shen, Jie Li, Sidan Liu	Mesoscopic simulation analysis of graphene positive electrode of lithium-air battery
15:40-16:00	**Coffee Break**		
16:00-16:20	V11	**Yinshi Li** *Xi'an Jiaotong University, China*	**Invited:** Benefits achieved from intelligent algorithm in solar energy utilization
16:20-16:40	V12	**Akeel Shah** *Chongqing University, China*	**Invited:** Shared-latent surrogate for high-dimensional stochastic input simulation
16:40-16:55	R31	Mengna Mao, Haotian Wu, Kun Fu, Qie Sun, Ronald Wennersten	Multi-objective scheduling of wind power-integrated energy system–application of the pseudo-weighted vector method



16:55-17:10	R32	Yu Liu, Liang Gong, Minghai Xu, Zhang Bai	Alternative design and dynamic evaluation of the mid-low temperature solar receiver/reactor for methanol decomposition
17:10-17:25	R33	S. Sadek, Shuai Deng, Mohamed E. Zayed	A review on adsorption-based atmospheric water harvesting systems driven by solar energy
17:25-17:40	R34	Ruiguo Yu, Yingzhou Sun, Xuewei Li, Jian Yu, Jie Gao, Zhiqiang Liu, Mei Yu	A cross-correlation encoder for wind power prediction
17:40-17:55	R35	Minjun Zeng, Jianfei Zhang, Zhiguo Qu	Effects of configuration parameters on ionic wind characteristics for electronics cooling
17:55-18:10	R36	Ligeng Li, Hua Tian, Lingfeng Shi, Gequn Shu, Hongfei Zhang, Jingyu Wang	Parametric analysis on CO_2 transcritical power cycle based on split concept in engine waste heat recovery
18:30-20:00	**Buffet Dinner**		



11th January, 2020, Saturday, 8:20-12:00 Room A

Subject: Plenary Lectures

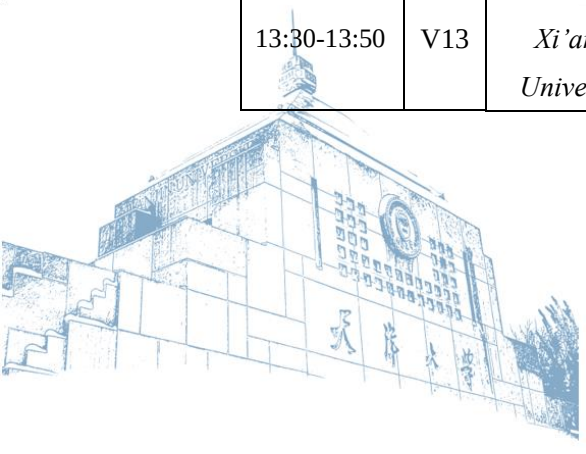
Time	Program	Chair
8:20-9:00	**Plenary – 5:** Artificial Leaf **Speaker :** Prof. Jinlong Gong, Tianjin University	**Prof. Qing Du**
9:00-9:40	**Plenary – 6:** Intelligent Decarbonisation **Speaker :** Prof. Markus Kraft, University of Cambridge	
9:40-10:00	**Coffee Break**	
10:00-10:40	**Plenary – 7:** Big Data Based Safety Design and Engineering Application of Traction Battery for Automotive Application **Speaker :** Dr. Ziliang Zhao, China FAW Group	**Prof. Raffaella Ocone**
10:40-11:20	**Plenary –8:** Fuel Cell Activities in SAIC and Technical Challenge for PEMFCs **Speaker :** Dr. Zhongjun Hou, Shanghai Hydrogen Propulsion Technology	
11:20-12:00	**Plenary -9:** Self-optimization Method of HEV Energy Management with Reinforcement Learning **Speaker** : Prof. Hui Xie, Tianjin University	
12:00-13:20	**Buffet Lunch and Rest**	

11th January, 2020, Saturday, 13:30-17:35 Room A

Subject-4: AI for Electrochemical Energy-2

Co-Chairs: Zhiguo Qu & Nada Zamel & Chao Tan

Time	ID	Author	Title
13:30-13:50	V13	**Zhiguo Qu** *Xi'an Jiaotong University, China*	**Invited:** Numerical and deep learning study on multi-scale problem for adsorption and diffusion processes in porous media



13:50-14:10	V14	**Nada Zamel** *Fraunhofer Institute for Solar Energy Systems, Germany*	**Invited:** Production of catalyst coated membranes for low temperature PEM fuel cells
14:10-14:30	V15	**Chao Tan** *Tianjin University, China*	**Invited:** Intelligent monitoring and measurement of industrial multiphase flow
14:30-14:45	R37	Yulin Wang, Tao Liu, Hua Li, Shixue Wang	Investigation of cathode catalyst layer with through-plane and in-plane ionomer-gradient distributions for polymer electrolyte membrane fuel cells
14:45-15:00	R38	Bowen Wang, Jin Xuan, Kui Jiao	Data-driven model of internal multi-physical quantities prediction of proton exchange membrane fuel cell
15:00-15:15	R39	Jie Li, Fangzheng Yan, Hong Sun	Study on mass transfer and performance of lithium air battery with different preload
15:15-15:30	R40	Yan Yin, Ruitao Li, Xiaoyu Qiu, Yanzhou Qin, Junfeng Zhang, Michael D. Guiver	The mechanism of crack evolution in catalyst layer for fuel cell
15:30-15:45	R41	Tao Liu, Yulin Wang, Huan Sun, Shenchun Liu	Dynamic behaviors of multiple droplets on gas diffusion layer surface of different pore size distribution
15:45-16:00	R42	Rui Wang, Yinshi Li, Xianhua Wu, Zhilong Zhao, Haiying Liu	High-performance flow battery coupling mass transport and redox reaction for large-scale energy storage
16:00-16-15	R43	Tianyu Zhang, Jie Li, Qiang Li, Mingfu Yu, Hong Sun	Mesoscopic dynamics simulation of lithium air battery: An electrolyte mass transfer study
16:15-16:25	**Coffee Break**		

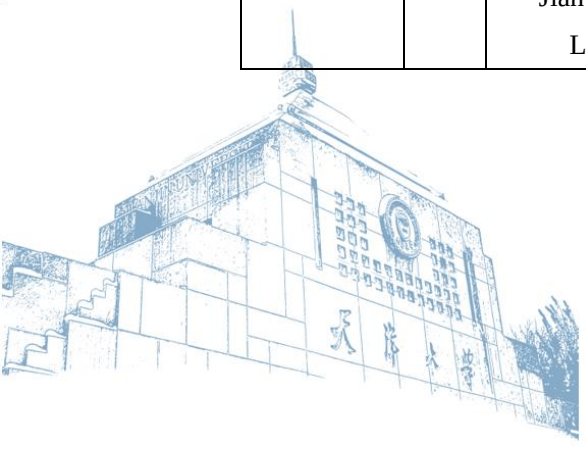
16:25-17:05	**Plenary-10:** Responsible Technology: Are We Ready for It? **Speaker:** Prof. Raffaella Ocone, Heriot-Watt University	**Chair:** **Prof. Kui Jiao**
17:05-17:35	**Closing Ceremony**	
18:30-20:00	**Buffet Dinner**	

11th January, 2020, Saturday, 13:30-16:10 Room B

Subject-5: AI for Power Machinery-2

Co-Chairs: Yun Wang & Billy Wu

Time	ID	Author	Title
13:30-13:50	V16	**Yun Wang** *University of California, USA*	**Invited:** Machine learning in dynamics and power management of PEM fuel cell
13:50-14:10	V17	**Billy Wu** *Imperial College London, UK*	**Invited:** Battery digital twins: The fusion of data, models and artificial intelligence for next generation electric vehicles
14:10-14:25	R44	Hui Wang, Xinyu Hui, Zhiguo Qu, Junqiang Bai	Physics-informed deep learning framework for flow prediction in energy saving airfoil design
14:25-14:40	R45	Wei Wang, Shuai Deng, Dongpeng Zhao, Li Zhao, Shan Lin, Mengchao Chen	Protons: A general methodology based on artificial intelligence for prediction and optimization of the thermodynamic cycle performance——a case study of ORC
14:40-14:55	R46	Chen Zhao, Bingfeng Zu, Yuliang Xu, Zhen Wang, Jianwei Zhou, Lina Liu	Analysis of an engine-start control process for single-shaft parallel HEV



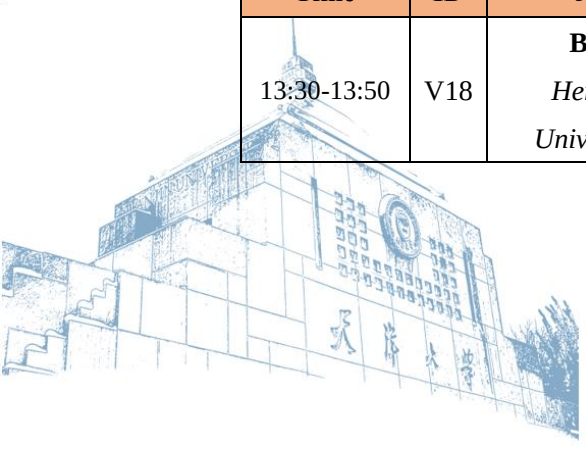
14:55-15:10	R47	Xu Ping, Fubin Yang, Hongguang Zhang, Baofeng Yao, Chongyao Wang, Xin Shi, Yuting Wu	Supervised regression of thermodynamic parameters of organic rankine cycle based on least squares method for basis function
15:10-15:25	R48	Feng Li, Chao Tan, Feng Dong	V-net imaging method for electrical resistance tomography
15:25-15:40	R49	Dongpeng Zhao, Shuai Deng, Li Zhao, Weicong Xu, Wei Wang, Mengchao Chen	A review on computational intelligence for thermodynamic system design
15:40-15:55	R50	Jingrui Li, Haifeng Liu, Ying Ye, Hu Wang, Mingfa Yao	Kinetic study of ignition process of methane/n-heptane fuel blends under high-pressure direct-injection engine-like condition
15:55-16:10	R51	Shichun Yang, Yang Hua, Fei Chen, Xiaoyu Yan, Yaoguang Cao, Xinhua Liu	Enabling digital solution for battery full-lifespan management
16:10-16:25	**Coffee Break (*please go to Room A*)**		
18:30-20:00	**Buffet Dinner**		

11th January, 2020, Saturday, 13:30-16:10 Room C

Subject-6: AI for Energy Systems-2

Co-Chairs: Bing Xu & Yanli Liu

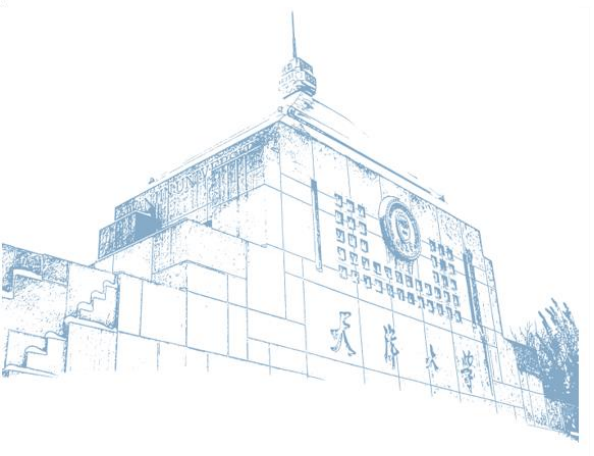
Time	ID	Author	Title
13:30-13:50	V18	**Bing Xu** *Heriot-Watt University, UK*	**Invited:** Global oil market uncertainty and oil prices: Data-centric solutions



13:50-14:10	V19	**Yanli Liu** *Tianjin University, China*	**Invited:** Data-analytics for enhanced situational awareness of the smart grid
14:10-14:25	R52	Cheng Fan	Development of deep transfer learning-based methodology for short-term building energy predictions
14:25-14:40	R53	Kang Song	Intelligent disturbance rejection-based path-following control of unmanned rollers
14:40-14:55	R54	Chang Su, Zhenyuan Xu, Justin NW Chiu	Building heat atlas of China: An application of spatial data science
14:55-15:10	R55	Haotian Wu, Mengna Mao, Xiao Zhang, Qie Sun, Ronald Wennersten	Prediction of building energy consumption–application of a particle swarm optimization-integrated long short-term memory method
15:10-15:25	R56	Xiaohai Zhang, Long Wang, Geng Chen, Mingtao Li	A new semi-supervised clustering method for household electricity load clustering
15:25-15:40	R57	Zhenyu Du, Shuai Deng, Li Zhao, Xianhua Nie, Shuangjun Li, Yue Zhang, Jie Zhao	High-throughput energy-efficiency performance screening on MOFs for CO_2 capture: A combination of molecular simulation and machine learning
15:40-15:55	R58	Zhihao Guo, Shuai Deng, Li Zhao, Shuangjun Li	Two-stage optimization design of adsorption carbon capture based on GA-CFD-ANN
15:55-16:10	R59	Weikang Zhu, Junfeng Zhang, Yan Yin, Michael D. Guiver	The structure-function relationship of hierarchically porous Co-N-C cathode catalyst layers for anion exchange membrane fuel cells
16:10-16:25	**Coffee Break (*please go to Room A*)**		
18:30-20:00	**Buffet Dinner**		

12th January, 2020, Sunday, 9:00-11:00
Tianjin University
Subject: Campus Visit

Time	Program
9:00-11:00	Visit History Museum of Tianjin University



Plenary speaker

Raffaella Ocone

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Short Biography

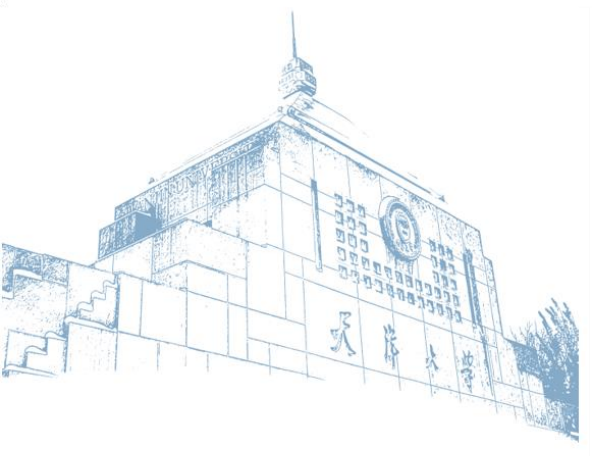
Raffaella Ocone obtained her first degree in Chemical Engineering from the Università di Napoli, Italy and her MA and PhD in Chemical Engineering from Princeton University, USA. She holds the Chair of Chemical Engineering in the School of Engineering and Physical Sciences at Heriot-Watt University (HWU) since 1999. She is a Fellow of the Royal Academy of Engineering, the Royal Society of Edinburgh, the Institution of Chemical Engineers, and the Royal Society of Chemistry. In 2007 she was appointed Cavaliere (Knight) of the Order of the Star of Italian Solidarity by the President of the Italian Republic. In The Queen's 2019 New Year Honours she was appointed OBE for services to Engineering. Recently she has been announced as one of the top 100 Most Influential Women in the Engineering Sector.

At HWU, she is the Head of the Multiphase Multiscale Engineering Modelling (MMEM) research group. Raffaella has worked in a number of highly recognised international Institutions such as the Università di Napoli (Italy); Claude Bérnard Université, Lyon (France); Louisiana State University (USA); Princeton University (USA). She was the first engineering "Caroline Herschel Visiting Professor" at RUHR Universität, Bochum, Germany (July-November 2017) and the recipient of a Visiting Research Fellowship from the Institute for Advanced Studies, Università di Bologna, Italy (March-April 2018). Raffaella's main area of research is in the field of modelling complex (multi-phase) reactive systems. Raffaella has taken a leading role in debating the role that ethics plays in engineering. Currently she is the EPSRC Established Career Fellow in Particle Technology.

Responsible Technology: Are We Ready for It?

Abstract

Technology is at the heart of the world where we live providing, among other things, energy solutions, assuring food and drinking water, generating electricity, goods and services. Emerging technologies rise fast carrying the potential to deliver economic and social benefits to a world that is challenged to sustain 10 billion people. Technological and scientific achievements pose challenges and opportunities. The exponential growth of computers, communication and artificial intelligence, for example, is changing the way we work and think, impacting on human activities and ways of living. This talk will explore how global responsibility is embedded in technological solutions and how the ethical dimension affects the way scientists and engineers work and operate.



Plenary speaker

Jinlong Gong

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Short Biography

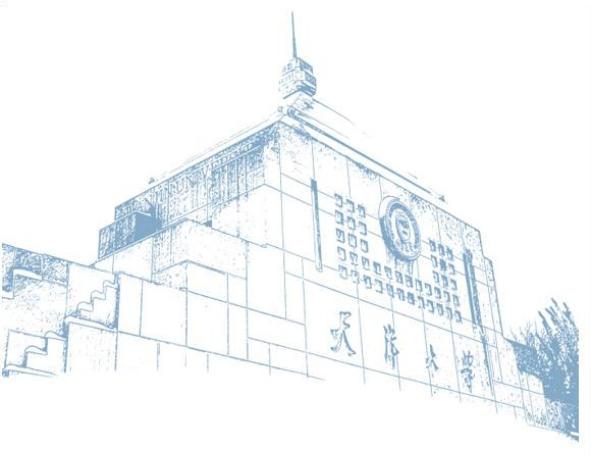
Jinlong Gong was born in Lanzhou, Gansu Province. He received B.S. (2001) and M.S. (2004) degrees from Tianjin University and a Ph.D. (2008) degree from the University of Texas at Austin (with C. B. Mullins), all in chemical engineering. He was a visiting scientist at the Pacific Northwest National Laboratory in 2007. After a stint with Professor George M. Whitesides as a postdoctoral research fellow at Harvard University, he joined the faculty of the School of Chemical Engineering and Technology at Tianjin University, where he currently holds a Cheung Kong Chair Professorship. Professor Gong is the Provost of Tianjin University.

Artificial Leaf

Abstract

"Artificial Leaf" is a promising route for the efficient conversion of CO_2 and H_2O into chemicals and fuels such as methanol and methane. To construct an efficient artificial leaf, it is necessary to find suitable catalysts to solve the important problems of carbon dioxide reduction reaction (CO_2RR) system: reaction kinetics, CO_2 activation, stability and selectivity. Here, we study the metal electrocatalysts (PdAu and AuCu) and metal oxides catalysts (Sn-based oxides and Cu-based oxides) systematically. Through the guidance of Density Functional Theory, the reaction kinetics can be enhanced though synergistic ensemble and ligand effects, which utilizes neighboring Pd-Au sites and electron transfer between them. Meanwhile, CO_2 can be activated efficiently via the construction of Cu vacancies at an abrupt surface over a dealloyed AuCu catalyst, as well as the introduction of oxygen vacancies over SnO_2. Moreover, maintaining a

moderate surface coverage of hydroxyl could solve the stability problem, since an appropriate amount of surface hydroxyl groups offers effective sites to boost CO_2 adsorption via hydrogen bond and CO_2 aqueous solution, which stabilizes surface hydroxyl groups on cathode. Finally, the selectivity of specific products can be improved via the adjustment of adsorption strength of key intermediates. By achieving a balanced adsorption of H over CO on Cu, the selective formation of CH_3OH could be promoted significantly. These findings revealed that the process of catalyst design could be largely simplified by theoretical calculations, which also suggests a logical extension to other catalysts for CO_2RR.



Plenary speaker

Zhongjun Hou

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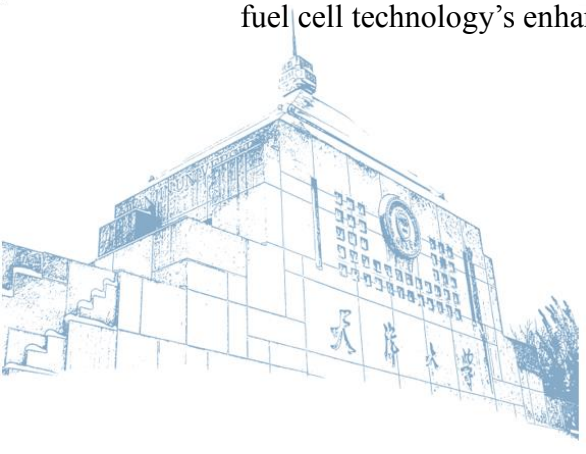
Short Biography

Dr. Zhongjun Hou received his doctor degree in chemical engineering from Dalian institute of chemical physics, CAS in 2003. He spent his career in the field of fuel cell technology, including being Chief Engineer and Deputy General Manager at Sunrise Power & National Engineering Research Center of Fuel Cell & Hydrogen Technology until 2018, and Vice general manager of Shanghai Hydrogen Propulsion Technology. He is the Winner of the national leader in science and technology innovation in the "Ten Thousand People Plan", and the State Council government special allowance experts. He had finished several Chinese “863 project” and participated in one Chinese “973 project”. He had published and co-published more than 20 papers and 60 patents.

Fuel Cell Activities in SAIC and Technical Challenge for PEMFCs

Abstract

The development of fuel cell electric vehicles (FCEVs) was performed in Shanghai Automotive Industry Company (SAIC) for nearly two decades. The performance, durability and reliability of the FCEVs were validated to meet the requirement of commercial application. To promote the FCEVs’ market extension, the cost, durability and performance of fuel cell should be further improved. The challenges against the fuel cell technology’s enhancement were discussed accordingly.



Plenary speaker

Markus Kraft

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Short Biography

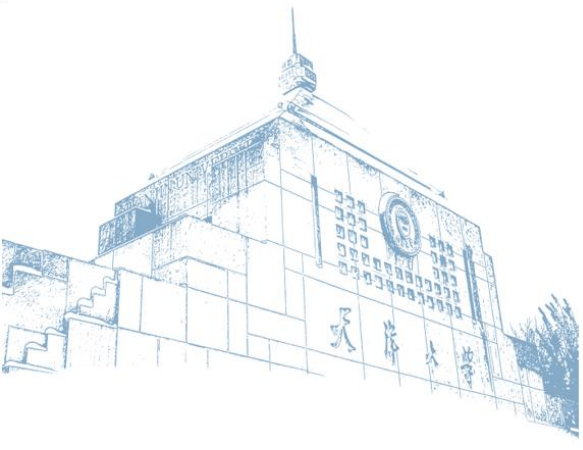
Prof Markus Kraft is a Fellow of Churchill College Cambridge and Professor in the Department of Chemical Engineering and Biotechnology. He is the director of CARES, the Singapore-Cambridge CREATE Research Centre, and Principle Investigator of C4T the “Cambridge Centre for Carbon Reduction in Chemical Technology”, which is a CARES research programme. Professor Kraft obtained the academic degree 'Diplom Technomathematiker' at the University of Kaiserslautern in 1992 and completed his Doctor rerum naturalium in Chemistry at the same University in 1997. Subsequently, he worked at the University of Karlsruhe and the Weierstrass Institute for Applied Analysis and Stochastics in Berlin. In 1999 he became a lecturer in the Department of Chemical Engineering, University of Cambridge. In 2012 he obtained a ScD form the same University. He has a strong interest in the area of computational modelling and optimisation targeted towards developing CO2 abatement and emissions reduction technologies for the automotive, power and chemical industries.

Intelligent Decarbonisation

Abstract

Global warming caused by greenhouse gases have caused great concern for a number of reasons. It is clear that drastic changes have to be implemented in the near future to reduce or stop the increase of average temperature and the many negative consequences that go with it. In my talk I shall concentrate on AI-based Cyberphysical systems and knowledge graphs. The decarbonisation of energy provision is key to managing global greenhouse gas emissions and hence mitigating climate change. Digital technologies

such as big data, machine learning, and the Internet of Things are receiving more and more attention as they can aid the decarbonisation process while requiring limited investments. The orchestration of these novel technologies, so-called cyber-physical systems (CPS), provides further, synergetic effects that increase efficiency of energy provision and industrial production, thereby optimising economic feasibility and environmental impact. This comprehensive review article assesses the current as well as the potential impact of digital technologies within CPS on the decarbonisation of energy systems. Ad-hoc calculation for selected applications of CPS and its subsystems estimates not only the economic impact but also the emission reduction potential. This assessment clearly shows that digitalisation of energy systems using CPS completely alters the marginal abatement cost curve (MACC) and creates novel pathways for the transition to a low-carbon energy system. Moreover, the assessment concludes that when CPS are combined with artificial intelligence (AI), decarbonisation could potentially progress at an unforeseeable pace while introducing unpredictable and potentially existential risks. The cyber-physical system we are currently developing is called J-Park Simulator (JPS) which is the signature project in the C4T programme of CARES at the University of Cambridge and part of the http://www.theworldavatar.com/ project. JPS consists of a network of IRIs comprising domain ontologies, a knowledge base and different types of agents. One important application is the modelling and optimisation of eco-industrial parks. This includes the electrical grid, various networks of materials, for example, waste heat network along with a detailed model of each industrial process. In my talk I shall explain how JPS works and show a couple of examples.



Plenary speaker

Xianguo Li

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Short Biography

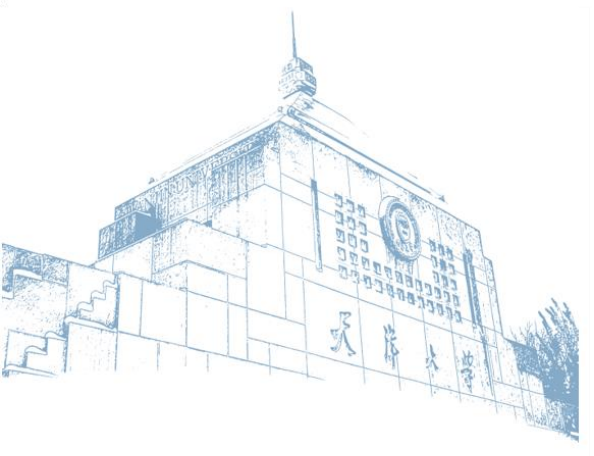
Dr. Xianguo Li is a Professor of Mechanical and Mechatronics Engineering, and a University Research Chair, at the University of Waterloo. Dr. Li is internationally recognized for his research in the area of fuel cells, liquid fuel atomization and sprays, and green energy systems. His book, Principles of Fuel Cells, is the world's first textbook on fuel cells and is used worldwide. Dr. Li has more than 210 journal and 240 conference publications. He has also authored/co-authored 4 books, over 20 book chapters, and 13 patent applications. His published articles have received extensive citations, with an H index of over 60. Dr. Li serves as the editor in chief for the International Journal of Green Energy, and also established the International Green Energy Conference series. He serves on the editorial/advisory board for more than 20 journals, book series, encyclopedia and handbooks. He is the founding division chair for the CSME Advanced Energy Systems Division, CSME Vice President Technical Program; President of the Fuel Cell Division of the International Association for Hydrogen Energy, and has also served as guest editors for a number of journals. He is a fellow of Canadian Academy of Engineering, Engineering Institute of Canada, and Canadian Society for Mechanical Engineering (CSME).

Energy 4.0: Evolution and Revolution of Energy Systems

Abstract:

Energy is essential for the very existence, development and prosperity of human society and human civilization. The evolution and revolution of energy systems have been accompanied with every significant improvement (or quantum jump) in human

civilization. However, energy is a double-edge sword, while it brings wealth and welfare to our society, its side effect has significant negative social, economic and environmental impact, including the pressing issue of climate change encompassing global warming and climate variability leading to extreme weather conditions with severe damages. The energy system has evolved through three stages that is being referred to as Energy 1.0, 2.0 and 3.0; and is in the transition process to Energy 4.0 where energy resources are efficiently utilized with cost effectiveness, sustainability and environmentally friendliness, energy connectivity and energy-mass (materials) interconnection and interchange – all these can be achieved through hydrogen as the carrier for both energy and materials. Hydrogen provides the possibility of clean, efficient, reliable and versatile connection to meet the need of future civilization for sustainable human civilization.



Plenary speaker

Deborah Logan

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Short Biography

Deborah Logan is Publishing Director for Elsevier's Energy & Earth journals' programme, which is the largest global publishing programme in the energy and earth sciences, and which includes many flagship titles publishing world-class content. Over the past few years, Deborah has looked to develop extensive publishing collaborations with China, with a strong focus on recruiting journal editors with high standards of excellence and in launching new journals that will shape and serve the future energy needs of our global society. Deborah is based in Paris and has been working with Elsevier since 2006. Before then, she worked at Oxford University Press in UK; at a non-governmental agency in Kenya; with the Japanese Ministry of Education; and at Sony in Japan. Deborah's passions lie in raising standards, championing excellence, and promoting greater diversity in science.

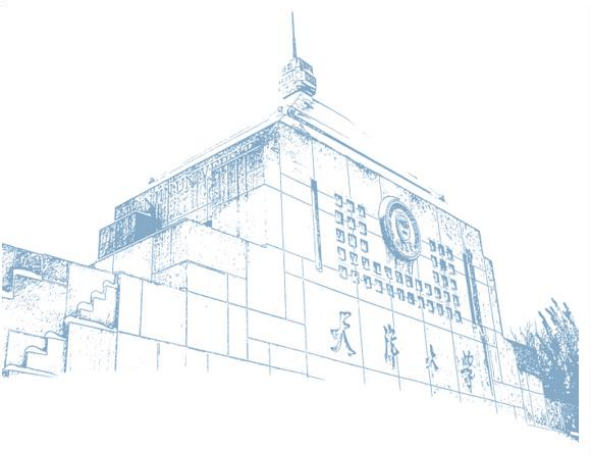
Publishing in Energy & AI: Trends and Perspectives

Abstract

The way science is disseminated is changing, with journal publishing seeing significant changes in recent years. These changes have a noticeable impact on how academic research will be written, published, promoted, and used in the future. Artificial Intelligence in the energy research field is a fast-growing area with strong support from government policy and funding bodies. Strong content growth from published research is expected in the coming years.

Understanding publishing trends and developments in this exciting new area is an important part of the energy research cycle. This talk will cover 3 areas that can equip

researchers with more insight on energy and AI trends; some factors to consider when presenting your work; and current and future developments in publishing. Deborah Logan will cover specific elements of each area and point participants to tools available for further guidance.



Plenary speaker

Henrik Madsen

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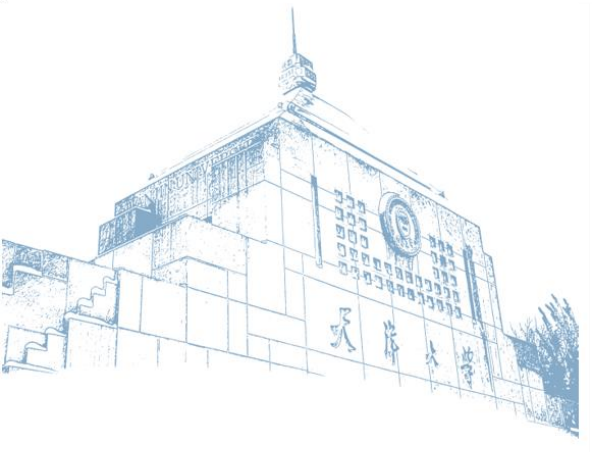
Short Biography

He got a PhD in Statistics at the Technical University of Denmark in 1986. He was appointed Ass. Prof. in Statistics in 1986, Assoc. Prof. in 1989, and Professor in Mathematical Statistics with a special focus on Stochastic Dynamical Systems in 1999. In 2017 he was appointed Professor II at NTNU in Trondheim. His main research interest is related to analysis and modelling of stochastic dynamics systems. This includes signal processing, time series analysis, identification, estimation, grey-box modelling, forecasting, optimization and control. Since 1992 he has been the leader of one of the most active research groups in Europe in relation to wind and solar power forecasting, as well as methods for operation of power system with a large penetration of fluctuating renewable energy production.

He has got several awards. Lately, in June 2016, he has been appointed Knight of the Order of Dannebrog by Her Majesty the Queen of Denmark, and he was appointed Doctor HC at Lund University in June 2017.

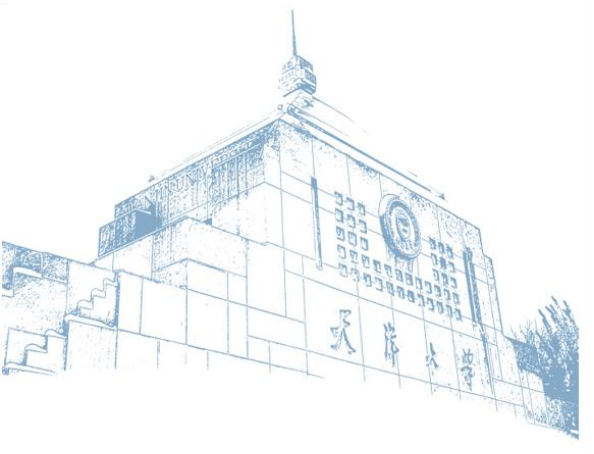
He has authored or co-authored approximately 550 papers and 12 books. The most recent books are Time Series Analysis (2008); General and Generalized Linear Models (2011); Integrating Renewables in Electricity Markets (2013), and Statistics for Finance (2015).



Accelerating the Green Transition Using AI and Energy Systems Integration

Abstract

The energy system needs to undertake a fundamental change from a system where production follows demand to a system where the demand follows the production provided by fluctuating renewable energy sources. This talk describes methodologies for accelerating the green transition using AI, big data analytics, grey-box models, IoT, Edge and Cloud Computing. First of all we shall focus on methods for characterizing and enabling the energy flexibility at the prosumer level, ie. at buildings, supermarkets, wastewater treatment plants, etc. Secondly we will describe a framework, called the Smart-Energy Operating-System, for using this flexibility for controlling the power load in integrated energy systems. Furthermore, this framework contains a set of methodologies which can be used for providing ancillary services (like frequency control, voltage control, and congestion management) for power networks with a large penetration of wind and solar power. The set of methodologies is based on grey-box modeling, forecasting, optimization and control for integrated (power, gas, thermal) energy systems. We will demonstrate that by carefully selecting the cost function associated with the optimal controllers, the system can ensure energy, cost and emission efficiency. Consequently, by using online-predicted values of the CO2 emission of the related power production, the framework provides an AI-based method to accelerate the transition to a fossil-free society.



Plenary speaker

Hui Xie

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Short Biography

Prof. Hui Xie received his PhD in propulsion machine and engineering at Tianjin University in 1998, and now he holds a position as professor and vice director in State Key Laboratory of Engines at Tianjin University, also as director of Autonomous Driving Cross-research Platform. His research interests include intelligent control of engine, powertrain and vehicle, autonomous driving vehicle and big data analysis. His research achievements include advanced intelligent control algorithms of engines, multi-core hardware control architecture and self-optimization energy management methods. He published 80+ papers and 30+ authorized invention patents. He got 2014 National Educating Achievement Award, 2018 China machinery industry science and technology award and 2019 Tianjin government science and technology award.

Self-Optimization Method of HEV Energy Management with Reinforcement Learning

Abstract

HEV is an effective powertrain to improve vehicle energy efficiency. How to carry out self-adaptive energy management according to the difference between driver and driving condition is the main challenge for hybrid vehicles to improve energy efficiency. A new energy management framework based on driver behavior observation and driving cycle prediction is proposed, in which, a reinforcement learning method is used to make energy management strategy adapt to the changes of driving cycle, and make the energy efficiency of vehicle system reach optimization by itself. The effectiveness of this method is verified by HIL test.

Plenary speaker

Jiujun Zhang

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Short Biography

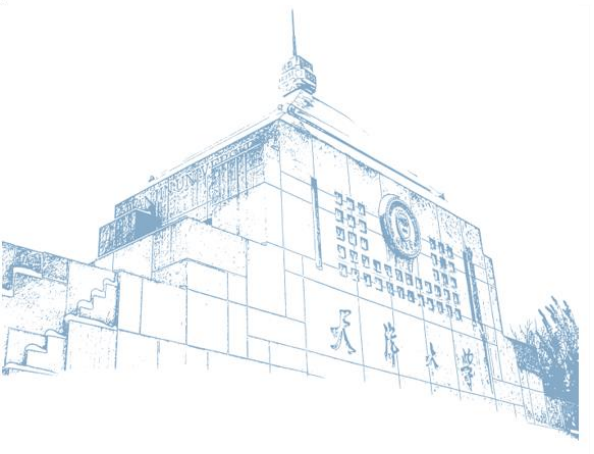
Dr. Jiujun Zhang is a Professor, Dean of the College of Sciences and Dean of Institute for Sustainable Energy at Shanghai University. He is a former Principal Research Officer at the National Research Council of Canada (NRC), Fellow of Academy of Science of the Royal Society of Canada (FRSC-CA), Fellow of International Society of Electrochemistry (FISE), Fellow of the Engineering Institute of Canada (FEIC), Fellow of the Canadian Academy of Engineering (FCAE), Fellow of the Royal Society of Chemistry (FRSC-UK), and the Founder/Chairman of The International Academy of Electrochemical Energy Science (IAOEES). In 2014, 2015, 2016, 2017, 2018 and 2019, Dr. Zhang was ranked as the top 1% of Highly Cited Researchers in the world, has also listed as one of the “3000 World's Most Influential Scientific Minds” by Thomson Reuters in 2014, 2015 and 2016. He was awarded the prize of “Lifetime Achievement” by the International Academy of Electrochemical Energy Science (IAOEES) in 2018. The technical expertise areas of Dr. Zhang are Electrochemistry, Photo electrochemistry, Spectro electrochemistry, Electro catalysis, Fuel cells (PEMFC, SOFC, and DMFC), Batteries, and Super capacitors. Dr. Zhang received his B.S. and M.Sc. in Electrochemistry from Peking University in 1982 and 1985, respectively, and his Ph.D. in Electrochemistry from Wuhan University in 1988. Starting in 1990, he carried out three terms of postdoctoral research at the California Institute of Technology, York University, and the University of British Columbia. Dr. Zhang holds more than 14 adjunct professorships, including one at the University of Waterloo, one at the University of British Columbia and one at Peking University. Up to now, Dr. Zhang has more than 500 publications with approximately 40000 citations, including 350 refereed journal papers, 25 edited /co-authored books, 43 book chapters, 190 conference keynotes and invited oral presentations, as well as over 16 US/EU/WO/JP/CA patents, and produced in excess of 90 industrial technical reports. Dr. Zhang serves as the Editor-

in-Chief of Electrochemical Energy Reviews (Springer Nature), and editor /editorial board member for several international journals as well as Editor for book series (Electrochemical Energy Storage and Conversion, CRC press). Dr. Zhang is also an active member of The Electrochemical Society ECS), the International Society of Electrochemistry (ISE), and the American Chemical Society (ACS, as well as the Canadian Institute of Chemistry (CIC).

Electrochemical Batteries and Lithium Batteries for New Energy Electric Vehicles: Status, Challenges, Perspectives

Abstract

This speech summarizes the current development of new energy in electric vehicles, especially the development of batteries, challenges and perspectives. The summarized batteries include lithium-ion batteries, hydrogen fuel cells, metal-air batteries (lithium and zinc), super Capacitors and lithium-sulfur batteries. This speech is divided into the following sections: (1) trends in the development of new energy vehicles; (2) power batteries for new energy vehicles; (3) development of lithium-ion batteries, current status, challenges and prospects. This speech predicts the development trend of power batteries and points out the directions of future R&D efforts.



Plenary speaker

Ziliang Zhao

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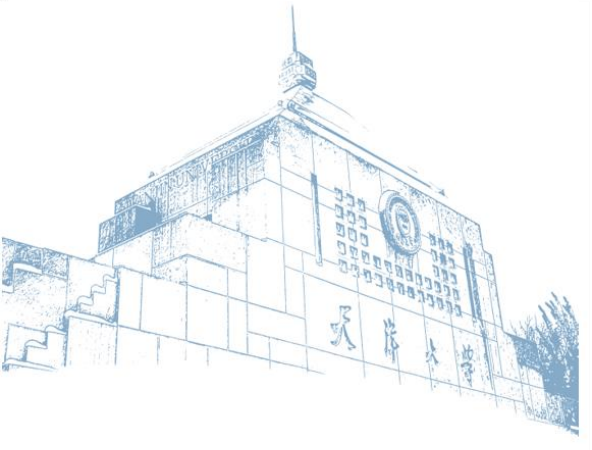
Short Biography

Dr. Ziliang Zhao, born in November 1971, is a senior research engineer of China FAW Group Corp. Dr. Zhao graduated in the vehicle engineering from Jilin University in 2001, and is currently appointed as the director of Battery Research Dept. of Limited New Energy R&D Institute of FAW Corp. He is long involved in the development of electric vehicle products and fuel cell power systems. As the project leader, he has leaded and accomplished a series of “863" special items of developing electric vehicles and FAW product development project.

Big Data Based Safety Design and Engineering Application of Traction Battery for Automotive Application

Abstract:

The traction battery is the core component of a new energy vehicle. Its safety problems have gained much attention concerning the sustainable development of new energy vehicles. This report presents an analysis on the vehicle fire caused by the thermal runaway of traction battery. Combined with the big data samples, a novel safety design and engineering application was proposed for the safety improvement of traction battery.



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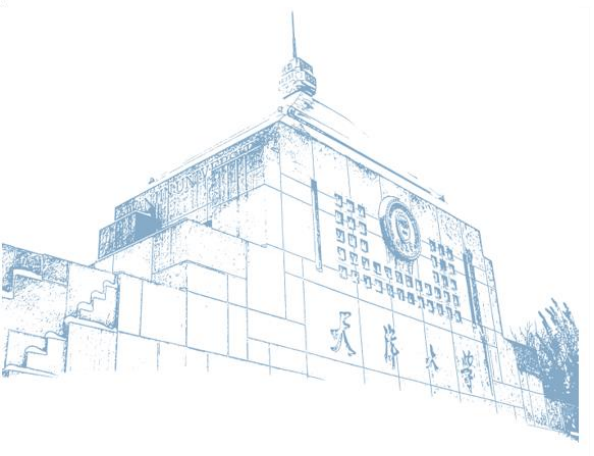

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